

**TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371**

P-00,1992

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)

**09/786512**

INTERNATIONAL APPLICATION NO.

INTERNATIONAL FILING DATE

PRIORITY DATE CLAIMED

PCT/DE99/02633

24 August 1999

31 August 1998

TITLE OF INVENTION

METHOD FOR PRODUCING METALLIC MICROSTRUCTURES AND USE OF THIS METHOD IN THE PRODUCTION  
OF SENSOR DEVICES FOR DETECTING FINGERPRINTS"

FEB 28 2001

APPLICANT(S) FOR DO/EO/US

Max Zellner, Jörg Zapf and Peter Demmer

Applicant hereby submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay.
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of International Application as filed (35 U.S.C. 371(c)(2))
  - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☐ has been transmitted by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. §371(c)(3))
  - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☐ have been transmitted by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☒ have not been made and will not be made.
8. ☒ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

**Items 11. to 16. below concern other document(s) or information included:**

11. ☒ An Information Disclosure Statement under 37 C.F.R. 1.97 and 1.98; **(PTO 1449, Prior Art, Search Report)**.
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 C.F.R. 3.28 and 3.31 is included.  
**(SEE ATTACHED ENVELOPE)**
13. ☒ A **FIRST** preliminary amendment.  
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☒ A change of power of attorney and/or address letter.
16. ☒ Other items or information:
  - a. ☒ Submission of Drawings - 2 sheets
  - b. ☒ EXPRESS MAIL #EJ077694547US dated February 28, 2001

RECEIVED  
FEB 28 2001  
PCT/US

09/786512

INTERNATIONAL APPLICATION NO.  
PCT/DE99/02631ATTORNEY'S DOCKET NUMBER  
P-00,1992

2 8 FEB 2001

17. ☒ The following fees are submitted:**BASIC NATIONAL FEE (37 C.F.R. 1.492(a)(1)-(5):**

Search Report has been prepared by the EPO or JPO ..... \$860.00

International preliminary examination fee paid to USPTO (37 C.F.R. 1.482) ... \$670.00

No international preliminary examination fee paid to USPTO (37 C.F.R. 1.482) but  
international search fee paid to USPTO (37 C.F.R. 1.445(a)(2)) ..... \$760.00Neither international preliminary examination fee (37 C.F.R. 1.482) nor international  
search fee (37 C.F.R. 1.445(a)(2)) paid to USPTO ..... \$970.00International preliminary examination fee paid to USPTO (37 C.F.R. 1.482) and all  
claims satisfied provisions of PCT Article 33(2)-(4) ..... \$ 96.00**ENTER APPROPRIATE BASIC FEE AMOUNT =**

CALCULATIONS

PTO USE ONLY

\$ 860.00

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from  
the earliest claimed priority date (37 C.F.R. 1.492(e)).

\$

Claims

Number Filed

Number  
Extra

Rate

Total Claims

14 - 20 =

0

X \$18.00

\$

Independent Claims

2 - 3 =

0

X \$80.00

\$

Multiple Dependent Claims

\$270.00 +

\$

**TOTAL OF ABOVE CALCULATIONS =**

\$ 860.00

Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also  
be filed. (Note 37 C.F.R. 1.9, 1.27, 1.28)

\$

**SUBTOTAL =**

\$ 860.00

Processing fee of \$130.00 for furnishing the English translation later than ☐ 20 ☐ 30 months  
from the earliest claimed priority date (37 CFR 1.492(f)).

+

\$

**TOTAL NATIONAL FEE =**

\$ 860.00

Fee for recording the enclosed assignment (37 C.F.R. 1.21(h)). The assignment must be  
accompanied by an appropriate cover sheet (37 C.F.R. 3.28, 3.31). \$40.00 per property

+

**SEE  
ATTACHED  
ENVELOPE****TOTAL FEES ENCLOSED =**

\$ 860.00

Amount to be  
refunded

\$

charged

\$

- a. ☒ A check in the amount of \$860.00 to cover the above fees is enclosed.
- b. ☐ Please charge my Deposit Account No. \_\_\_\_\_ in the amount of \$ \_\_\_\_\_ to cover the above fees. A duplicate copy of this sheet is enclosed.
- c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 501519. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 C.F.R. 1.494 or 1.495 has not been met, a petition to revive (37 C.F.R. 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Schiff Hardin & Waite  
Patent Department  
6600 Sears Tower  
Chicago, Illinois 60606-6473  
Customer Number 26574

SIGNATURE

James D. Hobart

NAME

24,149

Registration Number

-1-

**IN THE UNITED STATES ELECTED OFFICE OF  
THE UNITED STATES PATENT AND TRADEMARK OFFICE  
UNDER THE PATENT COOPERATION TREATY - CHAPTER II**

**PRELIMINARY AMENDMENT**

5      APPLICANT:      Max Zellner, Jörg Zapf and Peter Demmer

ATTORNEY

DOCKET NO.: P-00,1992

SERIAL NO.:

EXAMINER:

FILING DATE:

ART UNIT:

10 INTERNATIONAL APPLICATION NO.: PCT/DE99/02631

INTERNATIONAL FILING DATE: 24 August 1999

INVENTION: "METHOD FOR PRODUCING METALLIC  
MICROSTRUCTURES AND USE OF THIS METHOD  
IN THE PRODUCTION OF SENSOR DEVICES  
FOR DETECTING FINGERPRINTS"

**BOX PCT**

Assistant Commissioner for Patents  
Washington, D.C. 20231

S I R:

20 Please amend the above-identified International Application before entry  
into the National Stage before the U.S. Patent and Trademark Office under 35 USC  
371 as follows:

**IN THE SPECIFICATION:**

Page 1, lines 1-4, please replace these lines with the following headings and  
25 title;

--TITLE

“A SENSOR FOR ACQUIRING FINGERPRINTS  
AND A METHOD OF MANUFACTURING THE SENSOR”

BACKGROUND OF THE INVENTION--;

- 5 line 6, delete “[or: technology]”;  
line 7, change “[or: printed]” to read --or printed--;  
line 14, delete “[or: electrical, metallic]”;  
line 18, delete “[or: film]”; and  
line 30, replace “layers [or: planes].” with the following word and  
10 heading: --layers.

SUMMARY OF THE INVENTION--.

Page 2, line 1, delete “indicated in claim 1”; and  
lines 20 and 21, change “advantageous [sic: economical, simple]”  
to read --economically advantageous--.

- 15 Page 3., line 8, delete “Preferred...2 to 12.”;  
line 10, please delete the entire line;  
line 12, change “according to claim 2” to read --of the auxiliary  
bearer of quartz glass--;  
line 15, change “according to claim 3” to read --of the auxiliary  
20 bearer or borosilicate glass--;  
line 19, change “Through the” to read --The--;  
lines 19 and 20, delete “, the development according to claim 4”;  
line 21, change “According to claim 5, an” to read --An--;  
line 23, change “According to claim 6, the” to read --The--;

line 26, change "according to claim 7" to read --of the base layer or thin film--; and

line 27, change "According to claim 8, a" to read --A--.

5 Page 4, line 1, change the line to read --With an application of a planarization, the film or base layer can then receive a--;

line 3, change "development according to claim 10" to read --application of an insulating layer on the metallic fine structure--;

line 7, delete "according to claim 11";

10 line 9, change "layer, the construction according to claim 12" to read --layer on the base layer prior to removing the auxiliary bearer--;

line 12, change "According to claim 13, the" to read --The--;

line 16, after "drawing." insert the following heading:

--BRIEF DESCRIPTION OF THE DRAWINGS--; and

15 line 24, after "packaging." insert the following heading:  
--DESCRIPTION OF THE PREFERRED EMBODIMENTS--.

Page 5, line 23, before "removed" insert --be--.

Page 6, line 14, change "after the refining [or: remelting], as solder depots" to read --during remelting as solder deposits--; and

line 18, change "[or: divided]" to read --or divided--.

20 Page 8, line 1, change "Patent claims" to read --WE CLAIM:--.

Page 11, lines 2 and 3, please delete these lines;

line 5, delete "(3)" and "(1)";

line 6, delete "(5)";

line 7, delete "(3)" (both occurrences);  
line 8, delete "(1)"; (both occurrences);  
line 9, delete "(1) [sic]"; and  
line 11, delete "Figure 2".

5     **IN THE CLAIMS:**

        Please cancel claims 1-13, without prejudice, and substitute the following claims:

10         --14. A method for manufacturing metallic fine structures on a thin base layer made of a flexible organic material, said method comprising the steps of providing an auxiliary bearer made of a material that is at least largely transparent to laser radiation; applying a base layer onto the auxiliary bearer; producing a metallic fine structure on the base layer; and detaching the base layer from the auxiliary bearer by projecting laser radiation from a laser through the auxiliary bearer onto the base layer.--

15         --15. A method according to claim 14, wherein the auxiliary bearer is of quartz glass and the laser is an excimer laser having a wavelength of 248nm for the laser radiation.--

20         --16. A method according to claim 14, wherein the auxiliary bearer is made of borosilicate glass and the laser is an excimer laser having a wavelength of 350nm for the laser radiation.--

--17. A method according to claim 14, which includes, before applying the base layer on the auxiliary bearer, applying an adhesive layer onto the auxiliary bearer.--

5       --18. A method according to claim 17, wherein the adhesive layer is made of titanium.--

--19. A method according to claim 18, wherein the adhesive layer is applied to the auxiliary bearer by sputtering.--

--20. A method according to claim 17, wherein the adhesive layer is applied by sputtering.--

10       --21. A method according to claim 14, wherein the base layer is applied in the form of a film.--

--22. A method according to claim 21, wherein the film is made of a thermostable polyamide.---

15       --23. A method according to claim 21, which includes applying a planarization layer of electrically insulating material on the base layer before producing the metallic fine structure.--

20       --24. A method according to claim 14, which includes applying an insulating layer on the fine metallic structure, forming a second layer of metallic fine structure on the insulating layer and then detaching the base layer from the auxiliary bearer.--

5 --25. A method according to claim 24, which includes forming holes in the insulating layer before applying the second layer of metallic fine structure and forming through-contacts between the second layer of metallic fine structure and the first layer of metallic fine structure while forming the second layer of metallic fine structure.--

--26. A method according to claim 24, which includes, before detaching the base layer from the auxiliary bearer, applying a passivation layer onto the second layer of metallic fine structure.--

10 --27. A sensor arrangement for the acquisition of fingerprints, said arrangement comprising a thin base layer, a first metallic fine structure on a surface of the base layer, an insulating layer on the first metallic fine structure, said insulating layer having holes, a second metallic fine structure on said insulating layer having through-contacts to the first metallic fine structure and a passivation layer covering the second metallic fine structure.--

15

### **REMARKS**

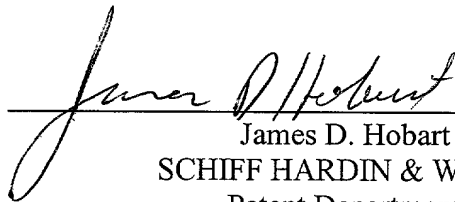
Claims 14-27 are presented for examination.

20 By this amendment, the specification has been amended to correct grammatical errors and to provide headings; claims 1-13, which were held allowable in the Preliminary Examination Report of May 29, 2000, have been rewritten to place them in form for examination in the United States Patent Office and to remove multiple-dependency.



It is submitted that the rewriting of claims 1-13 as claims 14-27 does not change the allowability set forth in the above-mentioned Preliminary Examination Report.

Respectfully submitted,

 (Reg. No. 24,149)  
James D. Hobart

SCHIFF HARDIN & WAITE  
Patent Department  
6600 Sears Tower  
233 South Wacker Drive  
Chicago, Illinois 60606  
Telephone: (312) 258-5781  
**Customer Number 26574**

DATED: February 28, 2001

09786542-02201  
T02220"2T593/60

2/PRTS

1

PCT/10598/102631  
09/786512  
P 00,1992  
JC03 Rec'd PCT/PTC 2 8 FEB 2001

## Specification

Method for manufacturing metallic fine structures, and application of the method in the manufacturing of sensor arrangements for the acquisition of fingerprints

5 In the manufacturing of circuit boards, a fundamental distinction is made between the widely used subtractive technique [or: **technology**], which is based on metal-covered substrates or, respectively, base materials and which removes the metal not required for strip [or: **printed**] conductors by etching, and the additive technique, which, building on substrates coated with bonding agent, applies the conductor material from baths only where strip conductors are  
10 required. Combinations of these techniques are also standard. Thus, in through-contacting, i.e., the coating with copper of the walls of perforations of conductive patterns – manufactured subtractively – that are present at both sides, the additive technique is used. In the semi-additive technique, the strip conductors are built up on thin metallic base layers, deposited for example without current, using galvanic [or: **electrical, metallic**]  
15 reinforcement, and the rest of the base layer is removed by etching, i.e., subtractively.

The techniques described above can also be applied in the manufacture of flexible wirings, i.e., what are known as flexible or membrane [or: **film**] circuits. However, in the products currently available on the market the structural dimensions of flexible wirings is greater than  
20 100  $\mu\text{m}$ . The manufacturing of significantly finer structures is currently not possible, due to the structuring methods taken over from circuit board technology and due to the adjustment precision, which is insufficient for a multilayer construction. This insufficient adjustment precision is thereby due to an unavoidable slack in the flexible organic bearer material of the flexible wirings.

25 Given demands for structural details smaller than 100  $\mu\text{m}$ , circuits are constructed on silicon using thin-film technology. These circuits can then be made flexible, within certain limits, by means of cost-intensive grinding of the silicon bearer. Comparable wiring densities could be realized on a flexible organic bearer material only by means of a corresponding number of  
30 additional wiring layers [or: **planes**].

The invention indicated in claim 1 is based on the problem of creating a simple and economical method for manufacturing flexible metallic fine structures having structural details smaller than 100  $\mu\text{m}$ . The method is thereby intended in particular also to be suitable for the manufacturing of the sensor field of sensor arrangements for the acquisition of fingerprints.

5

The invention is based on the finding that the disadvantages connected with the processing of flexible bearer materials can be avoided if a thin base layer made of a flexible organic material can first be applied onto a rigid auxiliary bearer and then detached again from the auxiliary bearer after the manufacturing of the metallic fine structures, without the risk of damages. Such a protective detaching of the base layer from the auxiliary bearer can be carried out from the back side of the auxiliary bearer using laser ablation, as long as the auxiliary bearer is made of a material that is at least largely transparent to the laser radiation used.

10

The inventive solution offers the following advantages:

15

- The use of thin-film technology on a rigid auxiliary bearer also enables the formation of multilayer fine structures.
- The high degree of resolution that can be achieved reduces the number of layers required in circuit board technology.
- The processing of rigid substrates is significantly more advantageous [**sic: economical, simple**] than the processing of flexible materials.
- A detaching of the one-layer or multilayer structure from the auxiliary bearer can be carried out in a rapid and economical manner.
- The assembly of ICs, passive components and sensors can for example take place, still on the auxiliary bearer, by means of gluing or soldering.
- The auxiliary bearer can be used multiple times.
- The degree of flexibility can be adjusted via the material and thickness of the lowest base layer.
- The isolation of the circuits is possible in an economical manner.
- A multilayer additional wiring can take place up to the system level.

20

25

30

09786510 022800

- High mechanical loading capacity of the flexible circuits.
  - It is possible to transfer the flexible circuit onto an arbitrary bearer that is also shaped three-dimensionally.
  - Given the use of temperature-stable materials (cyclization temperatures 350°C), the flexible circuits can also be used at an increased ambient temperature.
- 5      – Given the use of particular materials, e.g. polyimide, the flexible fine structures are very stable chemically.

Preferred constructions of the inventive method are indicated in claims 2 to 12.

10      A preferred application of the inventive method is indicated in claim 13.

The construction according to claim 2 enables a transparency of the auxiliary bearer to laser radiation of approximately 90 percent.

15      The construction according to claim 3 likewise enables a transparency of the auxiliary bearer to laser radiation of approximately 90 percent, whereby, however, here the relatively low costs for an auxiliary bearer made of borosilicate glass are also to be emphasized.

20      Through the application of an adhesive layer on the auxiliary bearer, the development according to claim 4 enables an improved adhesion of the base layer during the processing of the construction. According to claim 5, an adhesive layer made of titanium, which is transparent to the laser radiation during the detaching of the base layer, is thereby preferred. According to claim 6, the adhesive layer can advantageously be applied onto the auxiliary bearer with an extremely small layer thickness by means of sputtering.

25      The construction according to claim 7 enables an extremely simple and economical application of the base layer onto the auxiliary bearer. According to claim 8, a film made of a thermostable polyimide is thereby preferred, especially because by this means it is made possible for the finished product to be used also at an increased ambient temperature.

09786513 022804

According to claim 9, through the application of a planarization the film can then receive a very high surface quality, which enables the formation of the finest metallic structures.

The development according to claim 10 enables the application of a second layer of metallic fine structures, thus, for example, the production of a second wiring layer, whereby the flexibility of the overall construction is retained after the detaching from the auxiliary bearer. Through-contactings between the two wiring layers can thereby be realized in a simple manner according to claim 11 through the production of holes in the insulating layer.

By means of the application of a passivation layer, the construction according to claim 12 enables an effective handling protection of the overall multilayer construction.

According to claim 13, the inventive method can in particular be used for the manufacture of economical sensor arrangements for the acquisition of fingerprints.

In the following, exemplary embodiments of the invention are explained in more detail on the basis of the drawing.

Figure 1 shows a partial top view of the sensor field of a sensor arrangement for acquiring fingerprints,

Figure 2 shows a section according to line II – II of Figure 1,

Figure 3 shows an arrangement for detaching the multilayer construction according to Figure 2 from the auxiliary bearer, and

Figure 4 shows a possible application of inventively manufactured flexible fine structures for three-dimensional packaging.

Figure 1 shows a partial top view of the sensor field of a sensor arrangement for the acquisition of fingerprints, whereby the multilayer construction of the sensor field can be seen in the section shown in Figure 2. In order to enable a better overview, the individual layers of the multilayer construction in Figure 2 are shown in an exploded view.

The sensor field, shown in greatly simplified fashion in Figures 1 and 2, is a multilayer construction for the manufacture of a sensor arrangement that operates capacitively for the acquisition of fingerprints. An at least partially comparable multilayer construction of a sensor field follows for example from EP-B-0 459 808.

5 The manufacture of the sensor field shown in Figures 1 and 2 is based on a rigid auxiliary bearer 1 made of borosilicate glass. In order to ensure with certainty the adhesion of the subsequent construction on the auxiliary bearer 1, an adhesive layer 2 made of titanium is applied by sputtering. A base layer 3 is then applied on this adhesive layer 2. In the exemplary embodiment shown, this base layer 3 is a film made of a thermostable polyimide  
10 that has a thickness of 50  $\mu\text{m}$  and is applied by lamination. Subsequently, the base layer 3 is planarized by spin-on deposition of an insulating material, this process being depicted in Figure 2 by a separately shown planarization 4.

The subsequent production of metallic fine structures 5 can in principle be carried out in subtractive technique, additive technique, or semi-additive technique. In the depicted  
15 exemplary embodiment, the fine structures 5 are manufactured in semi-additive fashion as strip conductor structures. A photoresist (not shown in the drawing) is thereby applied to the planarization 4, which has been sputtered over its entire surface with a layer sequence of titanium and palladium, and this photoresist is structured in such a way that, for example,  
20 gold can be deposited galvanically, or copper can be deposited chemically or, respectively, galvanically, on the freely developed strip conductor pattern. After the stripping of the photoresist, the regions of the layer sequence of titanium and palladium not corresponding to the desired fine structures 5 are then removed down to the surface of the planarization 4 by selective etching.

25 A photostructurable insulating layer 6, in which holes 61, having for example a diameter of 25  $\mu\text{m}$ , can be made by exposure and developing, is then applied onto the fine structures 5. In the subsequent manufacturing of the second layer of metallic fine structures 7, which corresponds to the manufacture of the first layer of fine structures 5, through-contactings 71

are then produced that form electrically conductive connections between the two structural layers and that complete the structuring for the sensor field and the chip contacting.

The thickness of the fine structures 5 and 7 can for example be between 1  $\mu\text{m}$  and 5  $\mu\text{m}$ . The width of the individual structures and the spacing between the structures can  
 5 unproblematically be realized with measures of significantly less than 50  $\mu\text{m}$ .

Dependent on the circuit-related requirements, or, respectively, on the desire for an effective handling protection, the sensor field can finally be provided with a passivation layer 8, made for example of  $\text{BaTiO}_3$ ,  $\text{Al}_2\text{O}_3$ , or  $\text{SiO}_2$ .

The contacting of the highly poled control ICs (not shown in the drawing) of the sensor arrangement takes place by means of gluing or soldering. For a solder connection, SnPb bumps are thereby produced galvanically using thin-film technology, said bumps being used, after the refining [or: remelting], as solder depots for the chip contacting in flip-chip  
 10 technology.  
 15

After electrical and optical testing, the multilayer construction, made up of a plurality of connected individual arrangements, is for example separated [or: divided] into individual sensor fields, down to the adhesive layer 2, using an Nd:YAG laser. The ablation of the layer  
 20 construction from the auxiliary bearer now takes place with the aid of an excimer laser, operated with XeF (wavelength 350 nm).

The laser ablation mentioned above is carried out with the aid of an arrangement shown schematically in Figure 3. The laser radiation LS of the excimer laser is thereby directed onto  
 25 a deflecting mirror 10, in the direction of the arrow 9, and, via telecentric imaging lenses 11 and 12, is deflected onto the surface of the auxiliary bearer 1. The auxiliary bearer 1, and the construction A consisting of the layers 3 to 8 (cf. Figure 2), are arranged on an X-Y table (not shown in Figure 3), which enables a scanning with a relative motion between the laser  
 30 radiation LS, comprising a rectangular beam profile, and the auxiliary bearer 1. This scanning motion is indicated in Figure 3 by arrows 13.

Through the action of the laser radiation LS, in a cold process the adhesive effect between the adhesive layer 2 and the base layer 3 is increased at least to a great extent, so that the construction A can be detached, as is indicated in Figure 3 by the arrow 14. If the base layer 3 is applied onto the adhesive layer 2 with the aid of a glue, the laser radiation LS increases the effect of this glue in a comparable manner.

5

After a cleaning, the auxiliary bearer 1 with the adhesive layer 2 (cf. Figure 2) can be used again.

10

Figure 4 shows, in a greatly simplified schematic representation, how flexible fine structures 15 manufactured according to the inventive method can be used for three-dimensional packaging. After active and passive components 16 and/or sensors have been glued or soldered onto the last wiring layer, after the laser ablation described above they can be stacked one over the other by simple folding. The 3D package manufactured in this way can easily be BGA-contacted.

15

The inventive method can also be used for the manufacture of multilayer coils. Some single-layer or multilayer flexible coils, located next to one another, are thereby first manufactured in spiral form. These can now be placed one over the other by folding. In this way, it is possible to manufacture coils having high inductance in an economical manner.



## Patent claims

1. Method for manufacturing metallic fine structures (5) on a thin base layer (3) made of a flexible organic material, having the following steps:

- application of the base layer onto a rigid auxiliary bearer (1);
- production of the metallic fine structures (5) on the base layer (3);
- detaching of the base layer (3) from the auxiliary bearer (1) through the action of laser radiation (LS) directed through the auxiliary bearer (1) onto the base layer (3), whereby
- the auxiliary bearer (1) is made of a material that is at least largely transparent to the laser radiation (LS) used for the detaching of the base layer (3).

2. Method according to claim 1,

characterized in that

an auxiliary bearer (1) made of quartz glass is used, and in that an excimer laser having a wavelength of the laser radiation (LS) of 248 nm is used for the detaching of the base layer (3).

3. Method according to claim 1,

characterized in that

an auxiliary bearer (1) made of borosilicate glass is used, and in that an excimer laser having a wavelength of the laser radiation (LS) of 350 nm is used for the detaching of the base layer (3).

4. Method according to one of claims 1 to 3,

characterized in that

before the application of the base layer (3), an adhesive layer (2) is applied onto the auxiliary bearer (1).

5. Method according to claim 4,

characterized in that

an adhesive layer (2) made of titanium is applied onto the auxiliary bearer (1).

6. Method according to claim 4 or 5,  
characterized in that

the adhesive layer (2) is applied onto the auxiliary bearer (1) by sputtering.

7. Method according to one of the preceding claims,  
characterized in that

the base layer (3) is applied in the form of a film.

8. Method according to claim 7,

characterized by the use of a film made of a thermostable polyimide.

9. Method according to claim 7 or 8,  
characterized in that

a planarization (4) made of an electrically insulating material is applied onto the base layer (3).

10. Method according to one of the preceding claims,  
characterized in that

an insulating layer (6) is applied onto the metallic fine structures (5), and in that a second layer of metallic fine structures (7) is produced on the insulating layer (6), and in that the base layer (3) is then detached from the auxiliary bearer (19).

11. Method according to claim 10,  
characterized in that

holes (61) are made in the insulating layer (6) that, during the production of the second layer of metallic fine structures (7), form through-contactings to the first layer of metallic fine structures (5).

12. Method according to claim 10 or 11,  
characterized in that

before the detaching of the base layer (3), a passivation layer (8) is applied onto the second layer of metallic fine structures (7).

13. Application of the method according to one of claims 10 to 12 for the manufacture of sensor arrangements for the acquisition of fingerprints.

09785544 022001  
T00220" 2T555460

## Abstract

Method for manufacturing metallic fine structures, and application of the method in the manufacturing of sensor arrangements for the acquisition of fingerprints

- 5 A thin base layer (3) made of a flexible material is applied on a rigid auxiliary bearer (1), whereupon metallic fine structures (5), in particular strip conductor structures, are produced on the base layer (3). Subsequently, the base layer (3) is detached from the auxiliary bearer (1) by the action of laser radiation that is directed through the auxiliary bearer (1) onto the base layer (1) [sic].

10

Figure 2

T08220" 0T592260

- 1 -

IN THE UNITED STATES ELECTED OFFICE OF  
THE UNITED STATES PATENT AND TRADEMARK OFFICE  
UNDER THE PATENT COOPERATION TREATY - CHAPTER II

SUBMISSION OF DRAWINGS

5 APPLICANT: Max Zellner, Jörg Zapf and Peter Demmer

ATTORNEY

DOCKET NO.: P-00,1992

SERIAL NO.:

EXAMINER:

FILING DATE:

ART UNIT:

10 INTERNATIONAL APPLICATION NO.: PCT/DE99/02631

INTERNATIONAL FILING DATE: 24 August 1999

15 INVENTION: "METHOD FOR PRODUCING METALLIC  
MICROSTRUCTURES AND USE OF THIS METHOD  
IN THE PRODUCTION OF SENSOR DEVICES  
FOR DETECTING FINGERPRINTS"

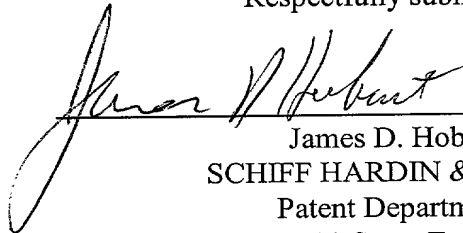
**BOX PCT**

Assistant Commissioner for Patents  
Washington, D.C. 20231

S I R:

20 Attached herewith are two sheets of Formal Drawings containing Figs. 1-4.

Respectfully submitted,



(Reg. No. 24,149)

James D. Hobart  
SCHIFF HARDIN & WAITE  
Patent Department  
6600 Sears Tower  
233 South Wacker Drive  
Chicago, Illinois 60606  
Telephone: (312) 258-5781  
Customer Number 26574

30

DATED: February 28, 2001

1/2

FIG 1

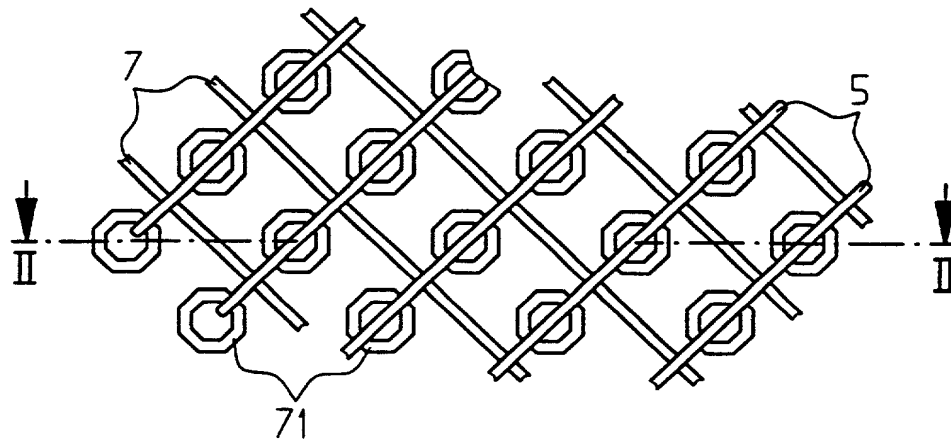


FIG 2

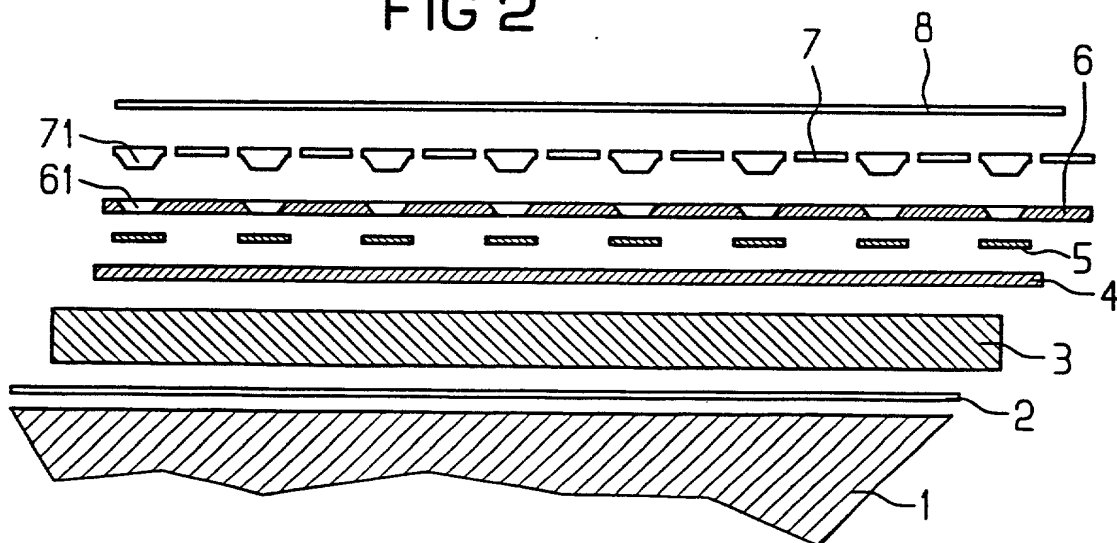


FIG 3

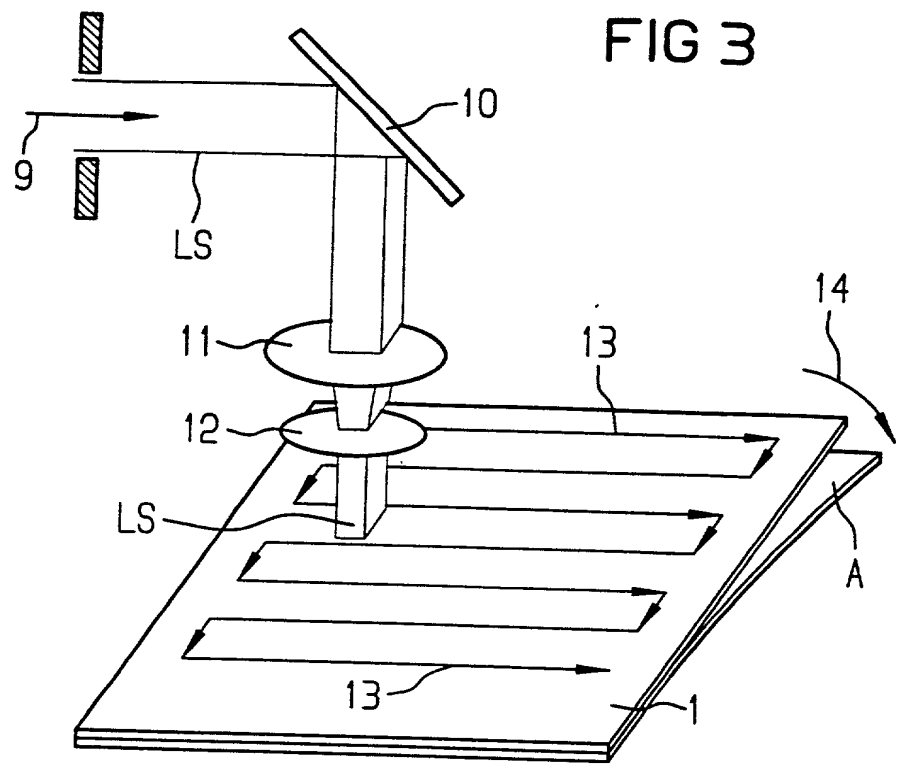
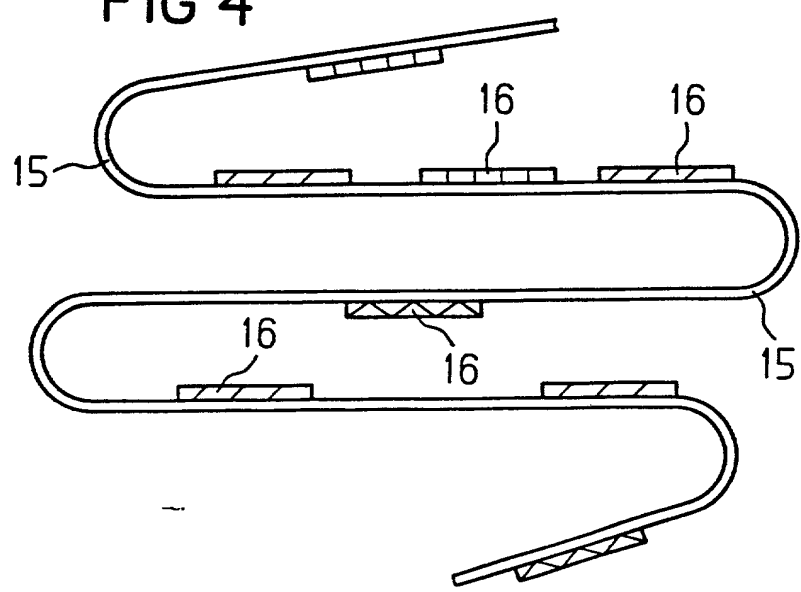


FIG 4



**IN THE UNITED STATES ELECTED OFFICE OF  
THE UNITED STATES PATENT AND TRADEMARK OFFICE  
UNDER THE PATENT COOPERATION TREATY - CHAPTER II**

### CHANGE OF ADDRESS OF APPLICANTS' REPRESENTATIVE

5      APPLICANT:            Max Zellner, Jörg Zapf and Peter Demmer  
        ATTORNEY  
        DOCKET NO.:       P-00,1992  
        SERIAL NO.:                                  EXAMINER:  
        FILING DATE:                                  ART UNIT:  
 10      INTERNATIONAL APPLICATION NO.: PCT/DE99/02631  
        INTERNATIONAL FILING DATE: 24 August 1999  
        INVENTION: "METHOD FOR PRODUCING METALLIC  
                          MICROSTRUCTURES AND USE OF THIS METHOD  
                          IN THE PRODUCTION OF SENSOR DEVICES  
 15                           FOR DETECTING FINGERPRINTS"

**BOX PCT**

Assistant Commissioner for Patents  
Washington, D.C. 20231

S I R:

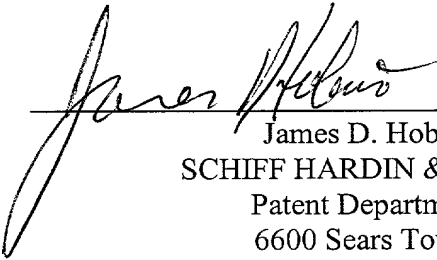
20           Members of the Firm Hill & Simpson designated on the original Power of Attorney have merged into the Firm Schiff Hardin & Waite. All future correspondence with regard to the above-identified application, therefore, should be sent to the following address:



- 2 -

SCHIFF HARDIN & WAITE  
Patent Department  
6600 Sears Tower  
233 South Wacker Drive  
Chicago, Illinois 60606-6473  
Customer Number: 26574

Respectfully submitted,

 (Reg. No. 24,149)  
James D. Hobart

SCHIFF HARDIN & WAITE  
Patent Department  
6600 Sears Tower  
233 South Wacker Drive  
Chicago, Illinois 60606  
Telephone: (312) 258-5781  
Customer Number 26574

DATED: February 28, 2001

# Declaration and Power of Attorney For Patent Application

## Erklärung Für Patentanmeldungen Mit Vollmacht

### German Language Declaration

Als nachstehend benannter Erfinder erkläre ich hiermit an Eides Statt:

dass mein Wohnsitz, meine Postanschrift, und meine Staatsangehörigkeit den im Nachstehenden nach meinem Namen aufgeführten Angaben entsprechen,

dass ich, nach bestem Wissen der ursprüngliche, erste und alleinige Erfinder (falls nachstehend nur ein Name angegeben ist) oder ein ursprünglicher, erster und Miterfinder (falls nachstehend mehrere Namen aufgeführt sind) des Gegenstandes bin, für den dieser Antrag gestellt wird und für den ein Patent beantragt wird für die Erfindung mit dem Titel:

Verfahren zur Herstellung metallischer Feinstrukturen und Anwendung des Verfahrens bei der Herstellung von Sensoranordnungen zur Erfassung von Fingerabdrücken

deren Beschreibung

(zutreffendjhaes ankreuzen)

☒ hier beigefügt ist.

☐ am \_\_\_\_\_ als

PCT internationale Anmeldung

PCT Anwendungsnummer \_\_\_\_\_

Eingereicht wurde und am \_\_\_\_\_

Abgeändert wurde (falls tatsächlich abgeändert).

Ich bestätige hiermit, dass ich den Inhalt der obigen Patentanmeldung einschliesslich der Ansprüche durchgesehen und verstanden habe, die eventuell durch einen Zusatzantrag wie oben erwähnt abgeändert wurde.

Ich erkenne meine Pflicht zur Offenbarung irgendwelcher Informationen, die für die Prüfung der vorliegenden Anmeldung in Einklang mit Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) von Wichtigkeit sind, an.

Ich beanspruche hiermit ausländische Prioritätsvorteile gemäss Abschnitt 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 119 aller unten angegebenen Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde, und habe auch alle Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde nachstehend gekennzeichnet, die ein Anmeldedatum haben, das vor dem Anmeldedatum der Anmeldung liegt, für die Priorität beansprucht wird.

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

the specification of which

(check one)

☐ is attached hereto.

☐ was filed on \_\_\_\_\_ as

PCT international application

PCT Application No. \_\_\_\_\_

and was amended on \_\_\_\_\_  
 (if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

0978654-02004  
 1992-04-29

# German Language Declaration

Prior foreign applications  
Priorität beansprucht

Priority Claimed

198 39 642.2 Germany 31. August 1998  
(Number) (Country) (Day Month Year Filed)  
(Nummer) (Land) (Tag Monat Jahr eingereicht)

☒ ☐  
Yes No  
Ja Nein

(Number) (Country) (Day Month Year Filed)  
(Nummer) (Land) (Tag Monat Jahr eingereicht)

☐ ☐  
Yes No  
Ja Nein

(Number) (Country) (Day Month Year Filed)  
(Nummer) (Land) (Tag Monat Jahr eingereicht)

☐ ☐  
Yes No  
Ja Nein

Ich beanspruche hiermit gemäss Absatz 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 120, den Vorzug aller unten aufgeführten Anmeldungen und falls der Gegenstand aus jedem Anspruch dieser Anmeldung nicht in einer früheren amerikanischen Patentanmeldung laut dem ersten Paragraphen des Absatzes 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 122 offenbart ist, erkenne ich gemäss Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) meine Pflicht zur Offenbarung von Informationen an, die zwischen dem Anmeldedatum der früheren Anmeldung und dem nationalen oder PCT internationalen Anmeldedatum dieser Anmeldung bekannt geworden sind.

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §122, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

(Application Serial No.)  
(Anmeldeseriennummer)

(Filing Date)  
(Anmeldedatum)

(Status)  
(patentiert, anhängig,  
aufgegeben)

(Status)  
(patented, pending,  
abandoned)

(Application Serial No.)  
(Anmeldeseriennummer)

(Filing Date)  
(Anmeldedatum)

(Status)  
(patentiert, anhängig,  
aufgeben)

(Status)  
(patented, pending,  
abandoned)

Ich erkläre hiermit, dass alle von mir in der vorliegenden Erklärung gemachten Angaben nach meinem besten Wissen und Gewissen der vollen Wahrheit entsprechen, und dass ich diese eidesstattliche Erklärung in Kenntnis dessen abgebe, dass wissentlich und vorsätzlich falsche Angaben gemäss Paragraph 1001, Absatz 18 der Zivilprozessordnung der Vereinigten Staaten von Amerika mit Geldstrafe belegt und/oder Gefängnis bestraft werden können, und dass derartig wissentlich und vorsätzlich falsche Angaben die Gültigkeit der vorliegenden Patentanmeldung oder eines darauf erteilten Patentes gefährden können.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

100220 2530650

## German Language Declaration

VERTRETUNGSVOLLMACHT: Als benannter Erfinder beauftrage ich hiermit den nachstehend benannten Patentanwalt (oder die nachstehend benannten Patentanwälte) und/oder Patent-Agenten mit der Verfolgung der vorliegenden Patentanmeldung sowie mit der Abwicklung aller damit verbundenen Geschäfte vor dem Patent- und Warenzeichenamt: (Name und Registrationsnummer anführen)

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (list name and registration number)

Messrs. John D. Simpson (Registration No. 19,842) Lewis T. Steadman (17,074) William C. Stueber (16,453), P. Phillips Connor (19,259), Dennis A. Gross (24,410), Marvin Moody (16,549), Steven H. Noll (28,982), Brett A. Valiquet (27,841), Thomas I. Ross (29,275), Kevin W. Guynn (29,927), Edward A. Lehmann (22,312), James D. Hobart (24,149), Robert M. Barrett (30,142), James Van Santen (16,584), J. Arthur Gross (13,615), Richard J. Schwarz (13,472) and Melvin A. Robinson (31,870), David R. Metzger (32,919), John R. Garrett (27,888) all members of the firm of Hill, Steadman & Simpson, A Professional Corporation.

And I hereby appoint

Telefongespräche bitte richten an:  
(Name und Telefonnummer)

Direct Telephone Calls to: (name and telephone number)

312/876-0200

Ext. \_\_\_\_\_

Postanschrift:

Send Correspondence to:

**HILL, STEADMAN & SIMPSON**  
**A Professional Corporation**  
**85th Floor Sears Tower, Chicago, Illinois 60606**

Voller Name des einzigen oder ursprünglichen Erfinders: <b>ZELLNER, Max</b>		Full name of sole or first inventor:	
Unterschrift des Erfinders <i>Max Zellner</i>	Datum <i>23.08.99</i>	Inventor's signature	Date
Wohnsitz <b>D-85244 Röhrmoos, Germany</b>		Residence	
Staatsangehörigkeit <b>Bundesrepublik Deutschland</b>		Citizenship	
Postanschrift <b>Bürgermeister-Haller-Str. 3a</b>		Post Office Address	
<b>D-85244 Röhrmoos</b>			
<b>Bundesrepublik Deutschland</b>			
Voller Name des zweiten Miterfinders (falls zutreffend): <b>ZAPF, Jörg</b>		Full name of second joint inventor, if any:	
Unterschrift des Erfinders <i>Jörg Zapf</i>	Datum <i>14.9.99</i>	Second Inventor's signature	Date
Wohnsitz <b>D-81927 München, Germany</b>		Residence	
Staatsangehörigkeit <b>Bundesrepublik Deutschland</b>		Citizenship	
Postanschrift <b>Dalandstr. 1</b>		Post Office Address	
<b>D-81927 München</b>			
<b>Bundesrepublik Deutschland</b>			

(Bitte entsprechende Informationen und Unterschriften im Falle von dritten und weiteren Miterfindern angeben).

(Supply similar information and signature for third and subsequent joint inventors).

103220 2593250

Voller Name des dritten Miterfinders: <b>DEMME, Peter</b>		Full name of third joint inventor:	
Unterschrift des Erfinders <i>P. Demme</i>	Datum <i>27.9.1989</i>	Inventor's signature	Date
Wohnsitz <b>D-81479 München, Germany</b>		Residence	
Staatsangehörigkeit <b>Bundesrepublik Deutschland</b>		Citizenship	
Postanschrift <b>Bertelesstr. 24</b>		Post Office Address	
<b>D-81479 München</b>			
<b>Bundesrepublik Deutschland</b>			
Voller Name des vierten Miterfinders (falls zutreffend):		Full name of fourth joint inventor, if any:	
Unterschrift des Erfinders	Datum	Inventor's signature	Date
Wohnsitz		Residence	
Staatsangehörigkeit		Citizenship	
Postanschrift		Post Office Address	
Voller Name des fünften Miterfinders (falls zutreffend):		Full name of fifth joint inventor, if any:	
Unterschrift des Erfinders	Datum	Inventor's signature	Date
Wohnsitz		Residence	
Staatsangehörigkeit		Citizenship	
Postanschrift		Post Office Address	
Voller Name des sechsten Miterfinders (falls zutreffend):		Full name of sixth joint inventor, if any:	
Unterschrift des Erfinders	Datum	Inventor's signature	Date
Wohnsitz		Residence	
Staatsangehörigkeit		Citizenship	
Postanschrift		Post Office Address	

(Bitte entsprechende Informationen und Unterschriften im Falle von dritten und weiteren Miterfindern angeben).

(Supply similar information and signature for third and subsequent joint inventors).